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2015 Dietary Guidelines Advisory Committee

The National Dairy Council® (NDC) appreciates the opportunity to submit comments for consideration by the 2015 Dietary Guidelines Advisory Committee (DGAC) in response to the Federal Register notice (78 FR 51727) issued August 21, 2013.

The NDC, the non-profit organization founded by U.S. dairy farmers, is committed to nutrition research and education about dairy's role in the diet and health and wellness. NDC provides science-based dairy nutrition information to, and in collaboration with, a variety of stakeholders committed to fostering a healthier nation, including health professionals, educators, school nutrition directors, academia and industry. Established in 1915, NDC comprises a staff of registered dietitians and nutrition research and communications experts across the country. NDC is committed to helping improve child health and wellness through programs such as Fuel Up to Play 60, which encourages youth to consume nutrient-rich foods and achieve at least 60 minutes of physical activity every day.

The following comments are offered regarding dairy intake and bone health in adults as the DGAC undertakes the work of evaluating current science on health and nutrition in support of developing national food-based dietary recommendations. During the first 2015 DGAC meeting June 13-14, 2013, Work Group 3 identified "dairy products" as a priority topic for review. The new evidence described in these comments contributes to the body of science on the relationship between dairy intake and bone health reviewed by the 2010 DGAC, thus it is hereby submitted for the Committee's consideration for inclusion in the evidence-based review for the 2015 DGA.

#### **Dairy intake and bone health in the Dietary Guidelines for Americans**

In the U.S., > 40 million people currently have osteoporosis or are at high risk for developing this condition (1). The 2010 DGAC report stated "Moderate evidence indicates that the intake of milk and milk products is linked to improved bone health in children. Limited evidence suggests a positive relationship between the intake of milk and milk products and bone health in adults, but results are inconsistent due to variability in outcomes considered" (2). New research has been published since the 2010 DGAC evidence review that includes 8 trials and 2 prospective cohort studies, and overall, indicates a benefit of adequate dairy intake in this population.

#### **2010 Dietary Reference Intakes for calcium and vitamin D identify bone as key health benefit**

The Dietary Reference Intakes (DRI) for calcium and vitamin D were updated in 2010 based on evidence supporting the link between these nutrients and bone health throughout life (3). The DRI committee noted that genetics remains the chief determinant of bone mass. However, calcium supplementation increases skeletal size and mineralization, and because bone mineral content is not retained after supplementation stops, regular intake of calcium and vitamin D is recommended. Dairy foods are the

main food source of calcium and vitamin D for U.S. adults, as well as other nutrients important for bone health (4, 5).

### **Prospective cohort studies on dairy intake and bone health parameters find benefit of dairy intake**

A prospective cohort study conducted in Poland among 625 postmenopausal women aged >55 years examined the relationship between calcium from milk, milk drinks and cheese with bone mineral density and hip fracture incidence. There was a positive correlation between calcium intake from dairy foods and bone mineral density (BMD), and low dairy calcium intake was associated with previous bone fractures (6). A 12-year follow-up of the Framingham Offspring Study examined associations among various dairy foods including milk, cheese, yogurt, and cream, BMD and hip fracture risk in over 2,000 men and women aged 55 years. Most dairy intake was associated with higher BMD at the hip and spine, while fluid dairy intakes were associated with higher BMD at the hip but not the spine (7).

### **Trials find adequate fortified dairy intake improves BMD and bone metabolism markers in postmenopausal women**

Two publications from The Postmenopausal Health Study were published in 2010 and 2011 that tested the effect of fortified dairy foods on bone metabolism and bone mineral density in women 55-65 years old. Both 30-month studies tested the effect of 3 daily servings of fortified low-fat milk and yogurt that contained 1,200 mg calcium/day plus 7.5 ug D<sub>3</sub>/day during the first 12 months and 22.5 ug D<sub>3</sub>/day during the last 18 months. In the 2010 study, the fortified dairy foods increased calcium, vitamin D, magnesium and phosphorus intakes, and improved BMD in arms, total spine and total body (8). The 2011 study found fortified dairy foods resulted in more favorable changes to total body BMD and markers of bone metabolism (indicating reduced bone remodeling) (9).

### **Trials find higher dairy intake improves or has neutral effects on BMD and bone metabolism markers in premenopausal women**

A study conducted in Iran among 38 premenopausal women, including 6 servings of milk/week containing 600 mg calcium for 2 months in the habitual diet resulted in improved hip and spine BMD (10). Another study in 20 premenopausal women compared the effects of 4 cups fat-free milk to a carbohydrate drink consumed 5 days/week in combination with resistance exercise. Calcium and vitamin D intake increased and markers of bone metabolism indicated a possible reduction in bone turnover (11). In a trial conducted in 30 obese Puerto Rican men and women, diets containing habitual calcium intake of < 700 mg/day were compared to diets containing either 1,300 mg calcium/day via dairy foods or 1,300 mg calcium/day from a combination of dairy foods and supplements for 21 weeks to test changes in body composition and blood lipids. As a secondary outcome, bone mineral content and density were assessed; no differences were observed (12).

### **Trials find higher dairy intake improves BMD or markers of bone metabolism during weight loss**

Three studies in women measured the effect of dairy intake on bone metabolism markers and BMD during weight loss, a time when bone can be lost. In one study, 29 overweight, sedentary women who typically consumed < 1 dairy servings/day followed an energy-restricted diet in combination with resistance exercise to lose weight. After 16 weeks, the women who had consumed a high dairy diet (> 1,200 mg calcium/day) had improved lumbar spine BMD compared to those consuming a low dairy diet (< 500 mg calcium/day) (13). A study of 81 overweight and obese premenopausal women evaluated the effects of diets containing high or adequate protein with high (6-7servings/day), medium (> 3 servings/day) or low dairy (< 1 serving/day) on markers of bone and calcium metabolism during weight loss. After 16 weeks, beneficial changes in bone markers were observed in the higher dairy groups compared to low dairy, though no group exhibited changes in BMD or BMC (14). A study in 113 obese

men and women > 40 years was designed to test the effect of dairy on bone during a 24-week weight maintenance phase following 12 weeks of weight loss; however, researchers did not observe a change in BMD during the 12 week weight loss phase. Throughout both phases, participants consumed either a recommended dairy ( $\geq 3$  servings/day) or low dairy ( $\leq 1$  serving/day) diet. The authors concluded that a weight maintenance diet providing recommended daily servings of dairy does not seem to affect changes in BMC after weight loss (15).

### Conclusion

Overall, the new evidence published since the 2010 DGAC review regarding dairy foods and bone health in adults has shown that dairy foods, calcium and vitamin D intake can improve bone mass and/or bone metabolism indices in adults, especially women. Inconsistencies in methodology and outcomes considered are apparent in some of this new research; however, the studies comparing effects of low dairy/dairy nutrient intakes to 3 servings of dairy/adequate dairy nutrient intakes found the most robust effects. This is not surprising given the importance of comparing levels of calcium and vitamin D below and above their thresholds for biological activity in study designs (16). Consuming adequate dairy products and fortified dairy foods can help adults meet calcium and vitamin D recommendations, improve bone mineral density and reduce bone turnover markers. The studies contribute to the body of science supporting the relationship between dairy intake and bone health in adults, and thus may warrant an update of the 2010 systematic review on dairy and bone health for the 2015 Dietary Guidelines for Americans.

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